

Science Teachers' Competencies at Secondary Schools

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Abstract

Teaching profession is the most demanding and affective job among other jobs. Successful teachers by all means play a major role in shaping and formulating their students' thought, personality, and values. It is a complex process and lifelong learning; this study came to answer the following questions: Are there any significant differences among science teachers' perceptions concerning their pedagogy in teaching? Are there any significant differences among science teachers' perceptions concerning learners' characteristics? Are there any significant differences among science teachers' perceptions of their professional development? A questionnaire adopted from two sources: "Teacher as Educational Leader" by Riley (2002) and "Teaching by Principles" by Brown (2000). Reliability and validity were conducted using content validity and construct validity; the data was collected then analyzed using the Statistical Packages for Social Sciences (SPSS). Results showed that science teachers characteristics made salient through the participants' responses can be considered as a framework for judging the efficiency of any teacher in general and science teachers in particular. This framework includes general characteristics of the science teachers and specific characteristics of subject matters teachers. These include that science teachers should be, Values flexibility, identifies examples of collaboration, develops effective instruction

Keywords: science, teachers, competencies, secondary schools

INTRODUCTION

It goes without saying that the teaching profession is the most demanding and affective job among other jobs. Successful teachers by all means play a major role in shaping and formulating their students' thought, personality, and values. It is a complex process and lifelong learning (Feiman-Nemser, 2008; Williamson & Clever-Bright, 2008). Learning to teach is a social, contextual practice reflecting values about the professional teacher and ideal citizen (Cochran-Smith, 2006). The predominant teacher paradigm, globally, seems to be the clinician-professional model (Darling-Hammond & Bransford, 2005; Shulman, 1987, 2005; Sockett, 2008). There are eight key competencies for lifelong learning paradigm were defined by (Commission of the European Communities, 2009a, b) as follows:

- Communication in mother tongue
- Communication in foreign language
- Mathematical, scientific, technology literacy
- Digital competence
- Learning to learn
- Interpersonal, civic competencies
- Entrepreneurship
- Cultural expression.

Teacher competencies were defined by many researchers as follows:

- Something that can be demonstrated to certain level of achievement along a continuum (Gonzales & Wagenaar, 2005).

- The ability to meet complex demands, by drawing on and mobility psychosocial resources in context (Rychen & Salganik, 2003).
- The combination of knowledge, skills, attitudes, values and personal characteristics, empowering the teacher to act professionally and approximately in a situation, deploying them in a coherent way (Koster & Dengerink, 2008).

Thus their effects shape and reform the whole community either positively or negatively. If we ask ourselves: "What are the successful teacher competencies? What characteristics and skills does he possess? What actions does he perform? And most important what effects does he have on his students?" . So this study came to elucidate the most important competencies among science teachers in Jordan. Since we prepare them for participating in building the community from their position in any school he is going to work.

LITERATURE REVIEW

Like any field, education is in need of distinguished teachers who drive the educational process towards the better, especially that education is the base of other disciplines. It might be better to compare the role of teacher in the classroom. Whatever role played by the teacher, it would affect students' performance. A teacher has the power to take decisions that either positively or negatively affects his students' behaviors. It is useful to distinguish between teaching competencies and teacher competencies. Teaching competencies can be

described as focused on the role of the teacher in action in the classroom, therefore directly linked with the craft of teaching (Hagger & McIntyre, 2006) .

Many studies have investigated the issue of science teachers' competencies. Parkinson (1998) conducted study which was conducted the information technology (IT) capabilities of a group of science teachers. The opportunities for developing their skills and using them in the classroom are matched against the use of IT by their mentors, It is argued that classrooms experience of using IT is an essential component of training course and science teachers' progress is hampered by the infrequent use of computers by school mentors. A significant number of the student sample (27%) did not have the opportunity to use IT during their school experience.

On the other hand, effective teaching research (Brophy & Good, 1986; Gage, 1978) and value-added research (Hanushek, 2002) endeavor to describe principles of effective teachers and effective teaching as linked with student results. Bearing in mind the distinction between teacher competences and teaching competences described before (OECD TALIS, 2009), we can then consider coming from literature review on effective teacher characteristics which provide a list of characteristics of teacher professionalism, Teacher Professionalism thus includes attitudes such as (commitment, confidence, Trustworthiness, respect), reasoning such as (analytical and conceptual thinking), expectations such as (drive for improvement, information-seeking, initiative) and leadership such as (flexibility, accountability, passion for learning) (Anderson, 2004; Hay McBer, 2000); it also stresses the importance of an individual and collective sense of self-efficacy (Geijssels et al., 2009; Goddard, Hoy & Hoy, 2000). Among the principles of effective and from literature review on effective teaching characteristics which describe features of effective teaching on which there is broad consensus. Among the principles of effective teaching (Brophy, 2001) there are principles to classroom climate, scaffolding, practice activities, coherent content, cooperative learning, goal oriented assessment, strategy teaching, and achievement expectations. While effective teaching variables can be categorized of six broad concepts: curricular dimension, teacher-orchestrated classroom management dimension, teaching strategy dimension (structured teaching; teaching strategies; teaching metacognitive strategies), climate dimension, evaluation/feedback dimension (Scheerens, 2007). Effective teaching studies showed the effectiveness of combining constructivist and direct instruction features. This implies pre-structuring and scaffolding, combined with self-regulated learning and guided reflection on learning processes. This showed the effectiveness and

importance of classroom organizational and teaching skills.

PURPOSE AND SIGNIFICANCE OF STUDY

This study aims at highlighting the most important competencies of science teachers in Jordan. By focusing on such characteristics, it raises the awareness of in-service science teachers to what should they possess to enhance the learning and the development of their students as well as of themselves. When considering such competencies, a teacher might be able to perform a good role of informed and efficient teacher in their classroom.

Therefore, the significance of this study is to informing the pedagogical behaviors and values of science teachers towards the better for their learners' performance, by answering the following questions:

- Are there any significant differences among science teachers' perceptions concerning their pedagogy in teaching?
- Are there any significant differences among science teachers' perceptions concerning learners' characteristics?
- Are there any significant differences among science teachers' perceptions of their professional development?

METHODS AND PROCEDURES

The study will be accomplished by collecting data from the targeted participants in the study whom will be requested to answer a questionnaire adopted from two sources: "Teacher as Educational Leader" by Riley (2002) and "Teaching by Principles" by Brown (2000). Before being distributed to the science teachers, to see their feedback, the questionnaire was modified according to referees comments, for validity purposes. So reliability and validity were conducted using content validity and construct validity, Corrected Item Total correlation was calculated and all items with less than 0.20 was discarded from the questionnaire. The data was collected then analyzed using the Statistical Packages for Social Sciences (SPSS). Then a discussion of the obtained data was presented in light of the aims and objectives of the study. Finally, implications and recommendations were offered.

LIMITATIONS OF THE STUDY

There are several reasons that hindering the generalization of the results of this study such as:

- *The sample was not covering all teachers in Jordan.*
- *Degree of the accuracy of the respondents.*
- *Validity and reliability of the instruments.*

FINDINGS, DISCUSSION AND ANALYSIS

In order to find out the most significant competencies a teacher has to have to be effective teacher, the frequencies of the participants' choices are calculated.

The relationship between the observed and the expected frequencies is also counted. The tables below present the findings of the study with reference to the participants' responses towards the questionnaire's items according to the following question:

1) Pedagogy: The main question is:
 - Are there any significant differences among science teachers' perceptions concerning their pedagogy in teaching?

INSTRUCTION

Table 1: χ^2 value and significance of science teacher's perceptions about their instruction

INSTRUCTION;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig
1 willing to engage in the continuous process of evaluating and improving instruction	10	10.5	-0.5	-0.15			
2 uses technology to plan, deliver, and assess instruction	7	10.5	-3.5	-1.08			
3 examines a repertoire of classroom management and teaching strategies	8	10.5	-2.5	-0.77			
4 implementing planned lessons effectively	11	10.5	0.5	0.15	5.857	5	0.320
5 values flexibility and uses a variety of appropriate instructional strategies to meet students' needs, including modalities, intelligences, and learning styles	17	10.5	6.5	2.01			
6 values and creates learning experiences which encourage critical thinking, problem solving, and other higher-order thinking skills	10	10.5	-0.5	-0.15			
Total	63						

O.F.: Observed Frequency
 Res.: Residual
 χ^2 : test for goodness of fit
 E.F.: Expected Frequency
 Std. Res.: Standardized Residual
 df: Degree of Freedom

The findings above indicate that there is no statistical significance between the observed and the expected frequencies with regard to sub-category 1.1(Instruction) in category 1 (Pedagogy). Other items. This indicates that all the competencies in this category are equally necessary to science teachers. However, most of the participants' responses fall on the choice concerning *value flexibility and uses a variety of appropriate instructional strategies to meet students' needs including modalities, intelligences, and learning styles*. These findings go in harmony with what have been discussed in the literature that students' needs, interests, and learning styles among others.

informed how to satisfy this willingness by examining a repertoire of teaching strategies.

It is very rare and striking that the findings revealed no consideration given to choice 2 which focuses in making use of technology in planning, delivering and assessing instructional strategies. Though this choice might be ranked in inferior position among other choices, the complete ignorance of it by the participants in the study reveals that that they are unaware of the vital and the effective role the technology can play in the process of teaching and learning. Most of current innovations in teaching strategies and materials highlight this role; therefore, keeping an eye out of it might represent a shortcoming in being an efficient teacher.

Further, choice four comes in the second which deals with implementing planned lessons effectively. Planning is crucial component of successful teaching and learning without which, the process of learning might go haphazardly and lose its essence in achieving goals and evaluating them afterwards. The choice 1 and 3 rank the third among other choices. These two choices demonstrate the importance of not only being willing to improve their instruction continuously as a science teachers but also being

It might be right to say that here in the Arab world, we are still creeping in the practices of traditional pedagogy and our educational institutions lack most of the technological pedagogical facilities the Western world employs in its educational system many decades ago. However, the following category in Pedagogy might reveal further points of the participants' views concerning this indispensable factor of teacher's competencies.

TECHNOLOGY

Table 2: χ^2 value and significance of science teacher's perceptions about using technology

TECHNOLOGY;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 uses technology as an effective instructional tool in the classroom in ways appropriate to the subject matter and to diverse learners	24	21	3	0.65			
2 integrates technology with teaching strategies.	26	21	5	1.09	4.667	2	0.097
3 uses technology to enhance communication with students, parents, colleagues, and the community	13	21	-8	-1.75			
Total	63						

According to the findings above, there is no statistical difference between the observed and the expected frequencies concerning the participants' responses towards this item (Technology). However, the observed frequencies reveal that the choice concerning integrating technology with teaching strategies and materials ranks the first. This rank might be natural because as effective science teachers, we have to refresh our knowledge about recent innovations in the field of teaching and learning by integrating them with our previous knowledge as to promote our pedagogy and achieve the desired goals. Furthermore, choice 1 ranks the second which implies the teachers' awareness for the

importance of technology and using it appropriately to suit the learners' taking into consideration their differences and the various subject matter. As for choice 3, which ranks the third, it seems that most of our teachers lack the effective way to communicate with students, parents, colleagues among others. This thing affects the profession of teaching and thus the performance of students. It follows that the good teacher should enhance and boost effective relationship with all members of the educational system and the community as to create a network of communicative sharing of decisions for the benefit of all.

COMMUNICATION

Table 3: χ^2 value and significance of science teacher's perceptions about their communication skills

COMMUNICATION;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 communicates the central principles of the discipline to students	9	15.75	-6.75	-1.70	6.270	3	0.099
2 employs culturally sensitive communication when working with students and families.	21	15.75	5.25	1.32			
3 works to build community	13	15.75	-2.75	-0.69			
4 demonstrates exemplary listening, written, and oral communication skills	20	15.75	4.25	1.07			
Total	63						

According to the findings related to *Communication*, there is no statistical difference between the observed and the expected frequencies. This indicates that all the items within this category are perceived equally important by the participants. Nevertheless the observed frequencies focus on item2. This is because **communication** lies in the heart of effective science teaching due to the fact that if communication breaks down among the member of a certain system, the whole work will be at risk. With regard to other items, the observed frequencies revealed that item 4 ranks the second which highlight the most effective ways of communication (listening, writing and oral skills). The order of such skills has a significant implication. The good teacher should listen before he speaks. Further, he should be

an efficient writer who can communicate effectively with the community for the benefit of his profession.

As for items 1 and 3, they are given the same importance according to the observed frequencies. Item 1 is very important for any science teacher in any subject matter. He has to inform the learners of what they are expected to achieve throughout the whole course in order to raise their awareness to their learning and thus making them responsible for it. Item 3 is a more general characteristic of the teacher and it might be true to say that it includes all the items in this category.

COLLABORATION

Table 4: χ^2 value and significance of science teacher's perceptions about their collaboration

COLLABORATION;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 identifies examples of collaboration and examines them in terms of group dynamics, teaming, and decision-making	26	21	5	1.09	2.381	2	0.304
2 understands how to collaborate with others in planning and implementing interdisciplinary lessons	16	21	-5	-1.09			
3 applies successful collaborative models and evaluates interpersonal skills	21	21	0	0.00			
Total	63						

Collaboration is another vital factor in effective teaching and it is interrelated to and comes as a result of communication among the members of the group. According to the findings of this category, there is no statistical difference between the observed and the expected frequencies as they are equally perceived by the participants. However, examining the observed frequencies shows that item 1 ranks the first. It

focuses on three key factors of collaboration: group dynamics, teaming, and decision-making. These factors if correctly perceived and taking into consideration when planning, implementing and evaluating by the teacher, he might succeed in directing his profession towards the better. There is only a slight difference in the rank between item 2 and item 3. The former stresses the need of

collaborating at the lesson level where teaching is regarded as interdisciplinary system where two teachers can collaborate together to teach one subject collaboratively. These collaborative lessons are almost not used by our teachers. It might be better as a teacher to compete with his colleague to achieve best results and inspire his students with the need to

improve themselves by competing with their peers but not forget to mix this competition with the zest for collaborative work that preserves the continuity and strengthens of the work. The latter item focuses on evaluating interpersonal skills, i.e., communication.

CURRICULUM AND INSTRUCTION

Table 5: χ^2 value and significance of science teacher’s perceptions about dealing with curriculum

CURRICULUM	AND	INSTRUCTION;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1	understands the interconnectedness of all content areas		7	15.75	-8.75	-2.20			
2	develops effective instruction using accurate content		19	15.75	3.25	0.82			
3	provides learning experiences that allow students to form connections with other disciplines		20	15.75	4.25	1.07	6.778	3	0.079
4	assists students in connecting subject matter to relevant life experiences		17	15.75	1.25	0.31			
Total			63						

Like the previous category, the findings related to this category reveal no statistical difference between the observed and the expected frequencies of the whole items. The items in this category are perceived equally important by the participants and this indicates the items complete and reinforce each other. However, the observed frequencies show that item 3 ranks the highest as it stresses the interconnectedness

of the content in relation to other content of subject matters and the connection in the discipline. As for the other items, they highlight the role of the teacher in choosing an accurate content that might lead to improving their instruction and transferring learning to other new experience out of the limits of classroom.

CURRICULUM DESIGN

Table 6: χ^2 value and significance of science teacher’s perceptions about curriculum design

CURRICULUM	DESIGN;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.	
1	understands how social issues influence curriculum	8	15.75	-7.75	-1.95				
2	understands principles of curriculum design and how to plan short and long-range instruction	31	15.75	15.25	3.84	20.492	3	0.000	
3	designs curriculum to provide all students with equal access regardless of their individual differences	11	15.75	-4.75	-1.20				
4	assesses, plans, and evaluates curricula	13	15.75	-2.75	-0.69				
Total			63						

With regard to this category, Curriculum Design, it is considered as indispensable factor in the whole profession and a vital role of the educational process. According to the findings related to this category, there is a statistical difference between the observed and the expected frequencies in favor of item 2 . It might be true to say that this item perceived as the

most important among other items due to the fact that it is the first pre-requisite in curriculum design, i.e., the teacher cannot reach an effective design of a curriculum unless he understands principles of curriculum design, and planning short and long-range instruction. This knowledge is deemed necessary to inform him design effectively.

ASSESSMENT

Table 7: χ^2 value and significance of science teacher’s perceptions about assessment process

ASSESSMENT;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 understands the general purpose and rationale for assessment	13	9	4	1.33			
2 demonstrates knowledge of various assessment strategies and instruments based on students' needs	7	9	-2	-0.67			
3 analyzes and selects appropriate assessment strategies and instruments based on students' needs	19	9	10	3.33	21.111	6	0.002
4 uses appropriate technology as a means to assess student learning	7	9	-2	-0.67			
5 evaluates, communicates, and appropriately uses assessment results	2	9	-7	-2.33			
6 uses assessment results to modify instruction as needed	5	9	-4	-1.33			
7 involves students in assessment including planning rubrics, implementing assessment measures, self-evaluation, and reflection	10	9	1	0.33			
Total			63				

Assessment, no doubt, represents a crucial characteristic of any systematic work. Only through

assessing the whole components of his pedagogy, the teacher could discover strengths and weaknesses and

thus take informed decision towards improving his practices. Considering the findings above, there is a statistical difference between the observed and expected frequencies in favor of item 2. The significance of this item might come due to that it stresses the need for being knowledgeable concerning a variety of assessment strategies and how to use them based on students' need. Succeeding in leading the change in any discipline entails knowledge about

all processes that affect and being affected by this discipline.

LEARNER CHARACTERISTICS

The main question is:

- Are there any significant differences among science teachers' perceptions concerning learners' characteristics?

AWARENESS OF HUMAN DEVELOPMENT

Table 8: χ^2 value and significance of science teacher's perceptions about human development

HUMAN DEVELOPMENT;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 understands theories and influences on human development	6	21	-15	-3.27	16.286	2	0.000
2 understands how development influences learning behavior	27	21	6	1.31			
3 uses theories of human development to create effective learning environments and experiences for all students	30	21	9	1.96			
Total	63						

It goes without saying that effective teacher create learner due to the fact that both are complete sharers in the responsibility of bringing the desired changes in the community, a change towards the better. As much as human development is concerned, teacher leaders should strive to put human development in their prior concerns since they have the keys for the development gate. Teacher leaders should adapt a humanistic view when dealing with learners. This can be achieved through focusing on their needs, interests, learning styles, individual differences, among other affective factors.

The findings related to this category reveal that there is a statistical difference between the observed and the expected frequencies in favor of item 1. This item receives much importance as it demonstrates the need for understanding theories and influencing human development. However, understanding such theory is only one step in a long the road. The process of putting such theories into practice is what matters in this respect.

AWARENESS OF LEARNING AND MOTIVATION

Table 9: χ^2 value and significance of science teacher's perceptions about learning and motivation

LEARNING AND MOTIVATION;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 plans, implements, and evaluates appropriate instruction using a variety of learning theories	23	31.5	-8.5	-1.51	4.587	1	0.032
2 uses theories of human motivation to create effective learning environments for diverse populations including reluctant learners	40	31.5	8.5	1.51			
Total	63						

Motivation is by all means indispensable factor in the process of teaching and learning. It is the essence and the zest for bringing about a desired change. Therefore, any teacher should be intrinsically motivated. He should plant the seeds of motivation in the learners' wills in order to ensure long-life learning and thus promoting progressive development. If teacher succeed in attaining such goal, the whole members would build the community they are dreaming of. With reference to the findings

in this category, there is a statistical difference between the observed and the expected frequencies of the participant responses in favor of item 1. It might be true to say that item 2, *using theories of human motivation to create effective learning environments for diverse populations including reluctant learners*, comes as a result of item 1, *planning, implementing, and evaluating appropriate instruction using a variety of learning theories*, as the former might be considered a prerequisite of the latter.

AWARENESS OF HUMAN SIMILARITIES AND DIFFERENCES

Table 10: χ^2 value and significance of science teacher's perceptions about Human Similarities and Differences

HUMAN SIMILARITIES AND DIFFERENCES;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 seeks outside help as needed to remedy problems of distress and abuse	12	21	-9	-1.96	5.810	2	0.055
2 fosters considerations of multiple perspectives and appreciation for diversity in thinking	25	21	4	0.87			
3 accommodates for individual needs and abilities when planning, implementing, and assessing instruction	26	21	5	1.09			
Total	63						

No two individual learners are identical. Our brains are uniquely structured due to differences in background knowledge, emotions, abilities, interests, needs among others. The effective teacher should consider this fact when dealing with learners and tackling the whole profession.

The findings concerning this category reveal no statistical difference between the observed and the expected frequencies in the participants' responses. All the characteristics come under this category are perceived as equally important to the teacher, item 2 demonstrates the characteristic of willingness and openness to accept others views and ways of thinking even if they are different from yours. This is a crucial

characteristic of the teacher not only when dealing and communicating with the learners, but also with other participants in the educational system, i.e., his colleagues, parents, supervisors, managers administrators, among others. Further, item 1 highlights the emotional factor of the learners and how the teacher should know and deal with different individuals who has specific problems in this respect.

3) *Teacher Professional Development : The main question is:*
Are there any significant differences among science teachers' perceptions of their professional development?

PERSONAL DEVELOPMENT

Table 11: χ^2 value and significance of science teacher's perceptions about Personal Development

PERSONAL DEVELOPMENT;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 identifies areas of personal strengths and weaknesses as a beginning teacher	17	15.75	1.25	0.31			
2 adopts the characteristics of a life-long learner	12	15.75	-3.75	-0.94			
3 fosters self-exploration in students	27	15.75	11.25	2.83	13.889	3	0.003
4 willingly contributes, seeks assistance as needed, and evaluates role as an educational team member in an effort to foster a productive learning environment school-wide	7	15.75	-8.75	-2.20			
Total	63						

Personal development represents the essence and any profession without which the teacher might be in a rut and stuck to the traditional and out of date knowledge in the field. Consequently, this would affect not only the learners, but also the community around him. The effective teacher should keep refreshing his knowledge in the field and modify his pedagogy based on the continuous changes that have been approved to be successful and empowering

The findings above this category reveal that there is a statistical difference between the observed and the expected frequencies in favor of item 3 which demonstrate the characteristic of being to be the highest-ranked. This item stresses the need for the beginner teacher to reflect on his practices and examine his strengths and weaknesses and work on

them, the very preliminary step in the professional ladder. However, item 4 comes to highlight the next step for the good teacher, the willing striving for contributing , seeking support as needed, evaluating role as a member in the group as to productively promote the work of the whole group and the learning process.

Teachers' personal development should be reflected on the learners he teaches as the teacher-learner relationship is a reciprocal one. This has been focused on in item 3. Item 2, on the other hand, demonstrates a broad view of personal development, possessing the characteristics of lifelong learning.

CRITICAL REFLECTIVE PRACTICE

Table 12: χ^2 value and significance of science teacher's perceptions about Personal Development

REFLECTIVE PRACTICE;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 understands and values the role of reflection in learning as part of an ongoing process	20	15.75	4.25	1.07			
2 examines personal motives for selecting teaching as a profession and the responsibilities involved in that choice	15	15.75	-0.75	-0.19			
3 reflects on the leadership role played by teachers	6	15.75	-9.75	-2.46	9.698	3	0.021
4 takes responsibility for personal actions as a professional teacher	22	15.75	6.25	1.57			
Total	63						

Reflective practice is one way of getting professionalized in the job of teaching. Without reflecting on our daily practices as teachers, we would keep repeating ourselves disregarding our

weaknesses and wrong behaviors that need to be modified. Consequently, if effective development is to be achieved, reflective practices are the key to attain it.

The findings related to this category reveal that there is a statistical difference between the observed and the expected frequencies of the participants' responses in favor of item 4 which demonstrates the need for looking to model professional teacher and

trying to imitate and learn from them. A teacher might ask himself: Why those teachers are considered successful teachers? What characteristics they have make them efficient teacher?

RESEARCH CONCERNS

Table 13: χ^2 value and significance of science teacher's perceptions about research concerns

RESEARCH;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 demonstrates an understanding of research terminology, concepts, and practices as presented in the professional literature	14	10.5	3.5	1.08			
2 demonstrates understanding of a variety of research designs, methodologies, measurements, analysis procedures, and the interpretation and communication of results	22	10.5	11.5	3.55	21.857	5	0.001
3 analyzes, synthesizes, and interprets current and historical research and practice	7	10.5	-3.5	-1.08			
4 recognizes how technology and other innovations assist in analyzing, synthesizing, and interpreting research	5	10.5	-5.5	-1.70			
5 approaches the discipline critically and evaluates new claims and interpretations in the field	11	10.5	0.5	0.15			
6 applies appropriate research and products and techniques to plan, evaluate, and improve instruction	4	10.5	-6.5	-2.01			
Total	63						

Research is another tool of professional development. It keeps us, as teachers, on the professional track. Without research our pedagogy would lack the authenticity and efficiency deemed necessary to enhance the teaching profession. Therefore, the efficient teacher should demonstrate ability and characteristics of a good teacher researcher, so as to inform his practice for the benefit of himself and his learners.

frequencies in favor of item 2 which constitutes the building blocks of conducting a research. This very characteristic is interrelated to the characteristic demonstrated by item 6 which focuses on using technology in conducting research and its role in synthesizing and interpreting data. Using technology, though is effective, not all teachers can master it. This skill is left for statistics experts to do the job of analyzing data. This might be the reason behind ranking this item in the fourth position.

The findings above reveal that there is a statistical difference between the observed and the expected

INFORMATION SEEKING

Table 14: χ^2 value and significance of science teacher's perceptions about information seeking

INFORMATION	SEEKING;	O.F.	E.F.	Res.	Std. Res.	χ^2	df	Sig.
1 accesses scholarly material		8	21	-13	-2.84	12.667	2	0.002
2 uses technology and other innovations in acquiring educational information		25	21	4	0.87			
3 keeps current in the profession as an active member of professional organizations and a consumer of educational research		30	21	9	1.96			
Total	63							

Information seeking is totally related to the conducting a research. One cannot start a research without knowing how to seek information which can be regarded as a skill. Only, efficient teacher possess the capacities of seeking relevant information that inform their actions when dealing with the members in the educational system.

CONCLUSIONS AND IMPLICATIONS

According to what have been discussed so far about the major characteristics of science teachers, it might be concluded that these characteristics made salient through the participants' responses can be considered as a framework for judging the efficiency of any teacher in general and science teachers in particular. This framework includes general characteristics of the science teachers and specific characteristics of subject matters teachers. These include that science teachers should be:

According to the findings in this category, there is a significant difference in favor of the characteristic demonstrated by item 3. The internet technology and other software programs are easy to use and within the reach of any individual. Besides, the research technology innovations make it easy to keep on the track of what have been done concerning many issues in education and improving instruction.

1. Values flexibility and uses a variety of appropriate instructional strategies to meet students' needs, including modalities, intelligences, and learning styles.

2. Integrates technology with traditional and experiential practices and materials.
3. Identifies examples of collaboration and examines them in terms of group dynamics, teaming, and decision-making.
4. Develops effective instruction using accurate content, understands how social issues influence curriculum.
5. Understands the general purpose and rationale for assessment.
6. Uses theories of human development to create effective learning environments and experiences for all students.
7. Plans, implements, and evaluates appropriate instruction using a variety of learning theories.
8. Uses theories of human motivation to create effective learning environments for diverse populations including reluctant learners.
9. *Seeks* outside help as needed to remedy problems of distress and abuse.
10. Uses technology and other innovations in acquiring educational information.
11. Keeps current in the profession as an active member of professional organizations and a consumer of educational research.
12. think critically, persistent urge to upgrade himself, has self-subordination, and has a feeling of excitement about his work

To sum up, science teacher should know how to achieve the changes desired and influence the whole around him in order to build the society. He should find effective pathways towards their hearts before their minds because when the love and respect him they would not but accept what he tries to convince them of. The science teacher should consider that he is the agent of the change in the community and work to achieve this change through empowering himself with characteristics of the influential effective teacher.

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